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Abstract

BACKGROUND: Performance during a rugby union game is based on technical and tactical performance and running activity. Notational and time-motion analyses may be useful to better understand the mutual influence of both factors. Thus, this study investigated the relationship between technical and tactical performance and running activity for both forwards and backs during official games of under 20 Six Nations Championship.

METHODS: Technical and tactical performance and running activity of thirty under-20 elite players (age range=18-20 years; total games=98) were assessed in relation to 20 key performance indicators (KPIs) and analysed separately for forwards and backs. General linear mixed models were performed to evaluate the relationship between KPIs, including subjects and games as random effect.

RESULTS: Different technical and tactical KPIs influenced the running activities for forwards and backs, while tackles, passes, and positive work rate influenced running activity (i.e., total distance, metres/minute, %high speed running, and explosive distance) in forwards. Only passes and possession influenced running activity (i.e., %high-speed running and distance covered above 14km/h, 17km/h, and 24km/h speed) in backs.

CONCLUSIONS: Technical and tactical performance affects running activities differently for forwards and backs. During training sessions, coaches should stimulate forwards to be more active (i.e. to complete more metres/minute, more explosive distance) and backs to control more the defensive structure (i.e., less %high-speed running and less distance covered above 14km/h and 17km/h speed). A progression from short to long game sequences, that quickly recreate the game plan and keep the momentum, could stimulate technical and tactical performance, as well as physical conditioning.

Key words: match analysis; GPS technology; rugby union; integrated analysis; notational analysis

Introduction

Rugby union is a high demanding collision sport requiring high-intensity running activities separated by periods of low-intensity activities and influenced by several factors, such as physical fitness level, players' technique, and team tactics. It is well established that over time, the game becomes faster, with more intensive and aggressive play.[1] As consequence, the technical and tactical factors and players' physical and anthropometric profiles change.[1, 2] Specifically, tackles, passes, rucks, and ball-in-play time increase, while scrums, lineouts, and mauls decrease.[1, 2] As the consequence, players' characteristics change as well, according to their positional roles (i.e., forwards and backs). In particular, backs are more involved in rucks and mauls that are traditionally the domain of the forwards.[1] In this scenario, new game-related tactics, along with different conditioning and recovery strategies, are required to effectively manage performance, training load and recovery.[1]

In sport sciences, performance analysis is usually investigated by means of the notational analysis (e.g., using video based systems) and the time-motion analysis (e.g., using Global Positioning System, GPS), that code athletes' relevant technical and tactical behaviors and running activities respectively during ecological situations (i.e., game match or training sessions).[3-7] Additionally, the performance analysis may be informative to program training exercises and tailored loads, to optimize physical performance and to prevent overtraining.[8]

In particular, notational analysis is focused on studying the interaction between players and the technical and tactical key performance indicators (KPIs), as a measure of positive and negative aspects of the performance.[9] Tackles, passes, turnovers, possession, scrums, lineouts, kicks, possession lost and regained are some of the principal KPIs used in rugby union notational analysis process.[4, 5, 10] However, reliability in video-based notational analysis process is limited by the time taken to complete analyses, the definition of movement categories, and the parallax error.[11]

On the other hand, during the time-motion analysis process, GPS technology is used since it is lightweight and non-intrusive, and provides real-time information of running activities during the game, (i.e., total distance, high speed running, explosive distance, accelerations, sprints),[3, 12-19] despite its reliability decreases with speed increasing of movement and the presence of change of direction movements.[20, 21]

Several studies[17, 22, 23] used both approaches to analyze technical and tactical performance, and running activity in rugby, although no relationship between them was investigated. The running activity (i.e., sprinting, striding, accelerating, changing of direction) seems to decline at the end of the game when it is separately analyzed from the technical and tactical performance.[20-21] At the same time, technical and tactical performance remains unchanged over the whole game both for backs and

forwards.[20] In fact, professional rugby players seem to maintain their ability in performing key actions through the whole competition, probably changing the game plan from an expansive to a conservative one, as already highlighted in rugby league.[22, 23] Greater physical demands are elicited in the early phases of the game, in association with a greater number of defensive collisions compared to the attacking ones, probably due to the higher cost of the defending gameplay.

Moreover, low to moderate relationship between technical and tactical KPIs (i.e., passes, tackles, line breaks, handling errors, set pieces, turnovers, possession lost and regained) and field-based fitness tests (i.e., repeated sprint ability, strength and power, speed, body composition) were found.[24] In particular, the large relationships between both 10 and 40 m sprint times and the number of line breaks and defenders beaten per game suggest that accelerations and maximal speed are likely to be important in rugby sevens. Evaded and carried tackles were also strongly correlated to a greater performance in horizontal and vertical jumps and peak power in body weight, and weighted counter movement vertical jumps were strongly related to the effectiveness in attacking and defensive rucks.[24]

However, to our knowledge, no study explains the relationship between technical and tactical game-related statistics and running activities during a match. Using technical and tactical and time-motion analysis could be relevant to analyze the mutual influence of both playing performance and running activities. Therefore, the aim of this study was to investigate the relationship between specific game-related technical and tactical KPIs (i.e., passes, tackles, kicks, possession lost, possession regained) and running activities (i.e., sprinting, striding, accelerating, changing of direction), in order to improve training plans specifically for forwards and backs.

Material and methods

Participants

Thirty (scrum halves excluded) under 20 elite players (age range = 18-20 years) including 15 backs and 15 forwards participated in the study. All players were recruited from the same elite under 20 Italian National team and had at least 6 years of experience in rugby trainings and competitions. A total of 5 games, performed during the under 20 Six Nations Championship (2018 edition), was considered for the purpose of the study. Informed consent was obtained, and the Italian Rugby Federation management approved the study.

Measures

Data from technical and tactical, and time-motion KPIs were recorded from 5 games and included 98 players' performance. Due to the different game patterns, all the analysis was separately performed for forwards (game performances n=62) and backs (game performances n=36). Scrum halves players were excluded because they usually represent an outlier performance.[5, 13-15] Indeed,

scrum-halves are highly specialized in roles where technical and tactical KPIs differ from those of the forwards and any other backs (i.e., 31 vs. 9 pass/match average for a common back role). The mean (±SD) number of observations for each player was 3 ± 1 (range 1–5).

Design and Procedures

Integral match video recordings were provided live by the World Rugby broadcast and stored as a mp4 file on a MacBook Pro 15© (Apple Inc). Notational analysis was performed at the end of each game by means of SportsCode Gamebreaker software (Sportstec, Sydney, Australia). According to Quarrie et al.,[15] the player's actions in possession of or close to the ball were coded. Examples of actions 'close to the ball' – tackles made and joining rucks and mauls – would typically be within one-man length radius of the location of the ball. Video analysis was carried out in relationship to ten technical and tactical KPIs (Table I, item 1-10), which were structured according to a previous study[25] and coaches' expertise (>10 years international experience). The same senior match analyst coded all the technical and tactical KPIs (>6 years of experience) for all 5 games. According to a previous study, the intracoder reliability was determined by randomly selecting 1 games and analyzing it twice 14 days apart.[26]

GPS-based time-motion analysis was carried out by means of 23 GPS units (K-Gps 10Hz, K-Sport®, Montelabate, Pesaro-Urbino, Italy). Thirty minutes before kick-off, GPS units were fixed on the torso of each player in a vest under the official competitive t-shirt and turned on. At the end of the game, devices were turned off and data were downloaded through the K-Fitness software (K-Sport®, Montelabate, Pesaro-Urbino, Italy). Ten time-motion KPIs from kick-off to the end of the game were analyzed. For more details about the time-motion KPIs see Table I (item a-j).

[Table I near here]

Statistical Analysis

For each KPI, medians (Mdn) and 95% confidence limits were separately calculated for the forwards and the backs. Technical and tactical KPIs were normalized to the total frequencies.[27] Consistency of both physical and technical and tactical performances over the 5 games was evaluated by performing the Kruskal-Wallis and Dunn's post-hoc test. ROUT method at 1%[28] was performed to detect outliers for the "time in play" indicator, in order to eliminate compromised GPS data recordings due to failed powering on or other technical issues.

General linear mixed models were performed to evaluate the relationship between technical and tactical and time-motion KPIs. Specifically, the technical and tactical KPIs entered the model as fixed effects, while the ten time-motion KPIs were used as separate dependent variables. Subjects and play were included as random effect within the model. All the above model was performed for

forwards and backs subcategories separately. Due to total kicks in play or in touch and to conversion attempts that are a peculiarity of backs role, we decided to exclude this variable when analyzing forwards subcategories. The level of significance was set at P=0.05. The Statistical Package R (version 3.6.2 R Foundation for Statistical Computing, Vienna, Austria) with the packages lme4[29] were used for all statistical analyses.

Results

Descriptive statistic (Mdn; 95% CI) of the twenty KPIs are displayed in Table II, both for forwards and backs. No outlier was detected for the "time in play" indicator. Thus, all the 98 game performances were considered for the statistical analysis.

[Table II near here]

The Table III reports the result for the significant model in general linear mixed analysis for the forwards' time-motion performance expressed according to the technical and tactical KPIs.

The main effects of Total Tackles were significant considering as dependent variable Total Distance [B = 98.99, 95% CI (13.37; 184.61); SE = 46.85; t-ratio = 2.113; p = 0.039], Explosive distance [B = 6.65, 95% CI (1.69; 11.60); SE = 2.74; t-ratio = 2.424; p = 0.019] and Average Peak Speed [B = 0.08; 95% CI (0.02; 0.15); SE = 0.04; t-ratio = 2.258; p = 0.029]. Main effects of Positive Work Rate were significant for Meters/Minute [B = 27.54 95% CI (17.40; 37.68); SE = 5.55; t-ratio = 4.965; p < 0.001], High Speed Running [B = 6.85, 95% CI (1.98; 11.58); SE = 2.58; t-ratio = 2.651; p = 0.012] and Average Peak Speed [B = 1.47, 95% CI (0.53; 2.41); SE = 0.51; t-ratio = 2.907; p = 0.006]. Moreover, as Average Peak Speed as dependent variable Possession Regained was significant [B = 0.59, 95% CI (0.15; 1.07); SE = 0.24; t-ratio = 2.495; p = 0.016]. No significant effect was observed for the other technical and tactical KPI.

[Table III near here]

The Table IV reports the results for the significant model in general linear mixed analysis for the backs' time-motion performance expressed according to the technical and tactical KPIs.

The main effects of Possession Regained were significant for % High Speed Running [B = 1.52 95% CI (-2.31; -0.23); SE = 0.56, df = 14.60; t-ratio = -2.689; p = 0.017], Distance > 14 km/h [B = - 42.56, 95% CI (-73.55; -10.12); SE = 18.6; t-ratio = -2.768; p = 0.022] and Distance > 17 km/h (B = -42.56 95% CI (-75.59; -14.68); SE = 18.61; t-ratio = -2.482; p = 0.035). Differently, for Distance > 24 km/h as dependent variable both Total Pass (B = -12.16 95% CI (5.01 ; 24.34); SE = 5.01; t-ratio = -2.429; p = 0.023) and Total Work Rate (B = 7.66, 95% CI (3.65 ; 24.34); SE= 3.65; t-ratio = 2.098; p = 0.0465) showed a significance. Differently no significant effect was observed for the other technical and tactical KPIs.

[Table IV near here]

Discussion

This study investigated the relationship between specific game-related technical and tactical KPIs (i.e., passes, tackles, kicks, possession lost, possession regained) and running activities (i.e., sprinting, striding, accelerating, changing of direction) in national elite Under 20 rugby players. For this purpose, we investigated the mutual influence of both factors during 5 international games (i.e., Six Nations Championship) using notational analysis (for technical and tactical indicators) and time-motion analysis. Due to the little evidences of the relationship between technical and tactical performance and running activities during games in rugby union, we think that using this ecological approach may be useful to improve training plans, specifically for forwards and backs. The main finding of our study was that game actions affected running activities differently for backs and forwards players' position. As a consequence, coaches and physical practitioners should plan and implement different training sessions according to players' position.

Since forwards and backs show different physical demands in rugby union,[3, 12, 14] correlations between different KPIs were expected for the two tactical roles. Total distance, explosive distance, and Average Peak Speed significantly affected the workload on the tackling area for the forwards. Indeed, according to Duthie et al.,[3] who quantified the movement patterns of rugby players and examined differences between positional groups, forwards were involved more in standing and fighting actions in possession of the ball or near the ball (i.e., scrumming, rucking, mauling) even though no trend to perform more tackles was reported with respect to backs. Moreover, forwards covered long distances at a relatively medium speed for moving from a breakdown to another, since they covered a unique role in forming the platform for offence and defense.[3] From the offensive point of view, higher density (i.e., meters/minute) in running patterns led to a higher involvement of the forwards in the open game (i.e., total passes completed and WR + (%)). According to Baker and Nance,[32] speed and acceleration represent the most important qualities in rugby players, especially for the forwards when tackling and regaining possession. These qualities are related to strength and power capabilities, as well as to specific game activities (i.e., number of line breaks and defenders beaten per match).[24]

From the defensive prospective, once the defensive line is organized, speed and acceleration (i.e., explosive running) allow defenders to prevent successful attacks. Indeed, the reducing of time and space for attackers will increase the probability to effectively perform a successful defense with a consequent turnover.[33] According to Hendricks et al.,[33] defending teams are more likely to win the breakdown and to regain possession when approaching attackers at a moderate or fast speed

movement. An effective defensive organization combining several factors (i.e., direction, shape, and speed) may allow defenders to perform more tackles, even doubling them within a single action. Thus, as highlighted in this study, a higher average peak speed along with an appropriate defensive strategy could be more likely to increase regained possession.

However, referring to high speed running for backs, the regained possession was inversely correlated to the % high-speed running and the distance covered above 14 and 17 km/h speed. Unlike the forwards, the backs spend approximately two to three times more time in high-intensity running and are more involved in off-the-ball utility movements (i.e., shuffling sideways or backwards to change field position).[3] It may be speculated that an effective, collective arrangement during the defensive phases is more important than the high-speed running ability of the single player. However, once the defensive line is organized, by shuffling sideways or backwards at low or medium speed, acceleration and high speed should be acted to attack the opponents' possession.

Consequently, coaches and physical trainers should consider these aspects when planning the defense-based training sessions. In other words, during training session they should not focus only on high speed running, but rather on high-pace organization and reorganization of the defense system, that is composed both by the defenders' distribution on the field and the effectiveness on impacts.

Since these events are processed at high pace in international level games, the probability to regain the possession is higher if defenders are quickly well organized in the defensive line and highly skilled in tackling. As reported for the senior level,[10] defensive skills are crucial for reaching success and coaching staff should focus on training tackling skills at high pace, in order to achieve defensive effectiveness in international competitions. Thus, when planning an exercise, coaches should decide to manipulate defensive constrains (i.e., direction and shape) to improve decision making in relation to the opponent side (e.g., drift defense practice task, where the defenders are outnumbered by the attackers or the rush defense practice task, where the defenders are equal or numerically superior to the attackers).[34, 35] Manipulating task constraints (i.e., changing rules, field dimensions, numbers of players) according to the desirable outcome could promote a more effective learning and transfer for game performance.

In addition, coaches and physical trainers should monitor running activities in small side games or full squad (15 vs. 15) during training sessions. In particular, during tactical training based on turnover balls (*regained possession*), trainers should stimulate forwards to be more active (i.e. to complete more distance, more meters/minute,) and backs to control more the defensive structure (i.e., less % high-speed running and less distance covered above 14 and 17 km/h speed) and to act high speed running once the structure is completed. Moreover, to act the game plan at the highest intensity level without downgrading the technical and tactical skills, they should train both cognitive (i.e., the

ability to quickly recognize the opponents' setting and to make a good decision making) and conditioning abilities (i.e., by repeating game skills at high-pace level). Practically, a progression from short to long game sequences (i.e., from a low to high number of phases) to quickly recreate the game plan and keep the momentum could stimulate players from a technical and tactical point of view, as well as in terms of physical conditioning (i.e., strength, repeated sprint ability with and without the ball, cognitive exercises).

Despite these results, caution is needed when interpreting our results. Both notational analysis (e.g., video-based systems) and time-motion analysis (e.g., GPS) are considered effective tools for studying team sports and better coaching, as well as a convenient and popular method to quantify movement patterns and physical demands in sport[9, 16] However, the dynamic nature of team sport and the consequent difficulty to interpret the data in term of replication may affect the results.

Conclusions

In conclusion, the present study demonstrates that the more the forwards are involved in game situations with or close to the ball the more their physical load increases. Moreover, from a technical and tactical point of view, regaining possession seems to be a matter of organization more than individual high-speed ability. Based on this finding, coaches and physical trainers could couple technical and tactical and physical aims during field-based training sessions. They should manipulate environmental constrains (e.g., changing field dimensions, manipulate players' starting position, the number of players involved in a training task) to enhance players' decision-making skills along with strength and conditioning capabilities. Further studies or coaching strategies could consider this analysis as a low-cost method with high benefits to gather crucial interpretation on the physiological demands related to the technical and tactical parameters.

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NOTES

Conflict of interest statement:

The authors have no conflicts of interest.

Authors' contributions

Alexandru N. Ungureanu : Conceptualization; Investigation and data collection; Writing—original draft; Writing—review and editing

Paolo R. Brustio: Formal Analysis; Writing—review and editing

Corrado Lupo: Supervision; Writing—review and editing

All authors read and approved the final version of the manuscript.

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Table I. Technical and tactical and time-motion performance indicators description.

#	**Technical and tactical indicators**	**Description**
1	Total tackles	Times a player tackled an opponent (all dominant, non-dominant, missed and assisted/doubled tackles).
2	Total tackle&jackal	Times a tackler contested the ball after the tackle by standing up, counter-rucking or returning in the defensive line.
3	Total jackal	Player contesting the ball on breakdown in both effective (regaining or slowing down the ball) and non-effective (without regaining or slowing down the ball).
4	Possession regained	Possession regained on breakdown, on the opponents' kick or loss.
5	Total ball carrier	Times a player carried the ball in both dominant (gains the collision with the defender and once he is brought to ground he acts properly in order to quickly release the ball) and non-dominant manner (loses the ball).
6	Total support	Times a player supported the ball carrier in order to quickly release the ball on breakdown
7	Total pass	Total passes completed by a player, both positive (which centers the target (receiver's hands) and allows receiver to maintain speed and acceleration) and negative (doesn't centers the receiver's hands)
8	Total kick	Total kicks in play or in touch conversion attempts
9	Total work-rate	Sum of KPIs from 1 to 8
10	Positive work-rate (%)	Ratio between the effective and non-effective KPIs
#	**Time-motion indicators**	**Description**
a	Total distance (m)	Total distance (m) covered since the unit turned on
b	Metres /Minute	Ratio between the distance covered and the time since the unit turned on
c	% High Speed Running	Ratio between distance covered at speed covered above 14km/h and the overall distance
d	Explosive Distance (m)	Distance (m) by a player when his speed is above 17 km/h and the acceleration is above 2.5 m/s^2
e	Accelerations	Counts of accelerations above 2.5 m/s^2
f	Sprints	Counts of crossed speed > 25km/h threshold
g	Dist > 14 km/h (m)	Distance covered (m) above 14 km/h speed
h	Dist > 17 km/h (m)	Distance covered (m) above 17 km/h speed
i	Dist > 24 km/h (m)	Distance covered (m) above 24 km/h speed
j	AveragePeak Speed (m/s)	Average of all peaks reached within the performance

Table II. Descriptive statistics (Mdn; 95% CI) of the twenty KPIs.

#	**Technical and tactical indicators**	**Forwards**	**Backs**
1	Total tackles	7 (6.21, 9.32)	6 (4.67, 8.27)
2	Total tackle&jackal	0 (0.44, 0.90)	0 (0.31, 1.13)
3	Total jackal	1 (0.62, 1.13)	0 (-0.4, 0.4)
4	Possession regained	0 (0.14, 0.43)	1 (0.74 , 1.81)
5	Total ball carrier	3 (2.78, 4.34)	3 (2.55, 4.45)
6	Total support	6 (5.31, 7.82)	3 (2.77, 5.06)
7	Total pass	0.83 (0.55, 1.11)	2 (1.60, 6.07)
8	Total kick	-	1 (0.80, 5.43)
9	Total work-rate	21 (17.38, 25.15)	22.5 (18.57,30.76)
10	Positive work-rate (%)	0.75 (0.61, 0.47)	0.64 (0.57, 0.70)
#	**Time-motion indicators**		
a	Total distance (m)	1077 (1154, 1854)	3150 (2678, 3621)
b	Metres/Minute	37 (31.33, 37.39)	40 (38.11, 43.94)
c	% High Speed Running	5.8 (5.64, 8.02)	15.55 (14.33, 17.82)
d	Explosive Distance (m)	32 (37, 76)	332 (296, 478)
e	Accelerations	9 (9.99, 25.57)	36.5 (32.23, 56.16)
f	Sprints	1 (1, 1)	2 (1.39, 3.28)
g	Dist > 14 km/h (m)	120 (129, 223)	523 (432, 652)
h	Dist > 17 km/h (m)	28 (41,87)	253 (225, 355)
i	Dist > 24 km/h (m)	7 (-13, 60)	26 (19, 44)
j	AveragePeak Speed (m/s)	5.4 (4.9, 5.6)	7.2 (6.8, 7.5)

Table III. General linear mixed model parameter estimates for the forwards' time-motion performance expressed according to the technical and tactical KPIs

	Total Distance (m)			Metres/min			% High Speed Running			Explosive Distance			AveragePeak Speed		
	B (95% CI)	SE	p value	B (95% CI)	SE	p value	B (95% CI)	SE	p value	B (95% CI)	SE	p value	B (95% CI)	SE	p value
Total tackles	98.99 (13.37, 184.61)	46.85	0.039*	-0.51 (-1.18, 0.16)	0 .37	0 .170	0.1 (-0.18, 0.36)	0 .15	0 .512	6.65 (1.69, 11.6)	2 .74	0 .019*	0.08 (0.02, 0.15)	0 .04	0 .029*
Total tackle&jackal	-380.74 (-800.72, 39.24)	229.79	0.103	2.12 (-1.16, 5.39)	1 .79	0 .243	1.05 (-0.17, 2.29)	0 .68	0 .129	-11.06 (-34.85, 12.35)	12 .95	0 .397	0 (-0.32, 0.31)	0 .17	0 .978
Total jackal	32.37 (-332.77, 397.52)	199.78	0.872	1.39 (-1.46, 4.23)	1 .56	0 .377	-0.16 (-1.34, 0.99)	0 .63	0 .800	-14.38 (-35.74, 5.94)	11 .3	0 .209	0.18 (-0.12, 0.49)	0 .16	0 .271
Possession regained	-249.18 (-796.56, 298.21)	299.49	0.409	-1.27 (-5.54, 3.00)	2 .34	0 .589	0.64 (-1.05, 2.43)	0 .93	0 .495	6.42 (-23.03, 37.46)	16 .31	0 .696	0.59 (0.15, 1.07)	0 .24	0 .016*
Total ball carrier	97.81 (-30.81, 226.44)	70.38	0.170	-0.04 (-1.04, 0.97)	0 .55	0 .949	-0.29 (-0.73, 0.15)	0 .24	0 .219	-2.28 (-9.57, 4.89)	3 .95	0 .567	0.03 (-0.08, 0.15)	0 .06	0 .630
Total support	43.73 (-44.7, 132.16)	48.38	0.370	-0.49 (-1.18, 0.20)	0 .38	0 .202	-0.04 (-0.30, 0.23)	0 .15	0 .788	1.38 (-3.65, 6.46)	2 .78	0 .622	0.02 (-0.04, 0.09)	0 .04	0 .506
Total pass	26.22 (-300.58, 353.03)	178.81	0.884	4.02 (1.47, 6.57)	1 .39	0 .006*	0.16 (-0.81, 1.15)	0 .54	0 .765	-3.78 (-21.59, 14.63)	9 .86	0 .703	0.12 (-0.13, 0.38)	0 .14	0 .377
Total work-rate	-6.01 (-46.24, 34.23)	22.01	0.786	0.04 (-0.27, 0.36)	0 .17	0 .798	0.02 (-0.10, 0.14)	0 .06	0 .724	0.29 (-1.93, 2.49)	1 .21	0 .81	-0.01 (-0.04, 0.02)	0 .02	0 .592
Positive work-rate (%)	501.03 (-799.28, 1801.34)	711.45	0.484	27.54 (17.4, 37.68)	5 .55	p<0.001*	6.85 (1.98, 11.58)	2 .58	0 .012*	-3.21 (-90.74, 77.25)	44 .56	0 .943	1.47 (0.53, 2.41)	0 .51	0 .006*
$R^2_{GLMM(c)}$	0.29			0.43			0.70			0.33			0.81		

Notes: B, Beta; 95% CI, 95% confidence interval; SE, Standard error; p, p value; $R^2_{GLMM(c),}$ conditional variance explained by the entire model.

Table IV. General linear mixed model parameter estimates (Beta, B (95% CI); Standard error, SE; significance, p value; conditional variance explained by the entire model, R^2GLMM(c)) for the backs' time-motion performance expressed according to the technical and tactical KPIs.

	% High Speed Running			Dist > 14 km/h (m)			Dist > 17 km/h (m)			Dist > 24 km/h (m)		
	B (95% CI)	SE	p value	B (95% CI)	SE	p value	B (95% CI)	SE	p value	B (95% CI)	SE	p value
Total tackles	-0.49 (-1.47, 0.05)	0.45	0.285	-18.59 (-56.22, 22.29)	22.5	0.418	-15.95 (-43.91, 12.04)	15.26	0.307	-5.65 (3.45, 22.66)	3.45	0.115
Total tackle&jackal	0.84 (-5.07, 4.35)	2.72	0.759	-9.95 (-229.39, 189.99)	126.5	0.938	26.15 (-119.89, 172.07)	87.73	0.769	3.81 (21.17, 23.58)	21.17	0.859
Total jackal	-1.01 (-3.26, 0.43)	0.99	0.325	-26.5 (-101.64, 51.31)	44.92	0.564	-23.56 (-83.78, 33.27)	31.92	0.470	-11.21 (7.92, 23.94)	7.92	0.170
Possession regained	-1.52 (-2.31, -0.23)	0.56	0.017*	-69.93 (-110.59, -29.88)	25.26	0.015*	-45.28 (-75.59, -14.68)	18.24	0.024*	-7.88 (4.57, 22.9)	4.57	0.098
Total ball carrier	-0.38 (-1.56, 0.73)	0.65	0.561	-13.72 (-68.76, 40.77)	32.34	0.676	-8.37 (-46.38, 30.2)	22.15	0.709	-5.39 (5.07, 22.85)	5.07	0.299
Total support	-0.54 (-2.1, 0.25)	0.67	0.423	-16.98 (-68.47, 33.94)	31.22	0.594	-11.56 (-49.07, 25.99)	22.03	0.606	-9.1 (5.27, 24.2)	5.27	0.097
Total pass	-0.95 (-2.45, -0.19)	0.64	0.153	-45.6 (-97.15, 10.48)	31.51	0.162	-30.97 (-69.87, 7.99)	21.51	0.164	-12.16 (5.01, 24.34)	5.01	0.023*
Total kick	-0.52 (-1,79, 0.11)	0.54	0.346	-15.16 (-58.02, 31.93)	26.25	0.570	-13.98 (-46.56, 18.7)	17.85	0.442	-6.02 (4.21, 24.76)	4.21	0.165
Total work-rate	0.63 (0.03, 1.7)	0.46	0.190	31.39 (-7.87, 68.15)	22.32	0.175	21.65 (-6.03, 49.69)	15.4	0.174	7.66 (3.65, 24.34)	3.65	0.047*
Positive work-rate (%)	-2.91 (-12.91, 8.29)	6.29	0.647	39.27 (-333.58, 426.84)	219.47	0.860	33.65 (-258.65, 312.56)	154.39	0.830	-27.05 (36.58, 22.27)	36.58	0.467
$R^2_{GLMM(c)}$	0.62			0.88			0.80			0.43		

Notes: B, Beta; 95% CI, 95% confidence interval; SE, Standard error; p, p value; $R^2_{GLMM(c)}$, conditional variance explained by the entire model.